

IN THE CLAIMS:

1-7. (canceled)

8. (currently amended) A signal fault detection system useable in electrical control sensors for shaft speed signal frequency change rate tests, detecting intermittent or "in-range" failures of the signal rate of change, comprising:

5 means for measuring frequency of a shaft speed signal;

means for calculating a rate of change (time derivative) of the measured signal;

means for estimating a short-term variance (standard deviation) of the measured signal rate of change using the equation: $\text{Var}[x] = E[x - E(x)]^2 = E[x^2] - E^2[x]$, where x is the measured signal rate of change, $E(x)$ is the expected value of x , $E[x^2]$ is the expected value of x^2 , calculated by estimating the average of x^2 ~~an estimated average of the measured signal squared rate of change over a predefined short term, and $E^2[x]$ is the squared value of $E[x]$, where $E[x]$ is calculated by estimating the a squared estimated average of the~~

10 ~~measured signal rate of change over the predefined short term;~~

15 measured signal rate of change over the predefined short term;

means for estimating the short-term variance $\text{Var}[x] = E[x^2] - E^2[x]$ by employing the following algorithm: $\text{Var}[x] = \text{Filtered} [(x)^2] - (\text{Filtered } [x])^2$;

means for comparing the estimated variance with a predefined variance limit for a predefined amount of time; and

20 means for deeming the measured signal invalid, if the estimated variance exceeds the predefined variance limit for the predefined amount of time.

9. (original) The system according to claim 8, wherein the means for comparing the estimated variance with a predefined variance limit for a predefined amount of time includes a latching counter.

10. (currently amended) The system according to claim 9, wherein the latching counter time out rate being proportional to a time period the measured input is ~~true~~ one.

11. (original) The system according to claim 8, wherein the means for estimating a short-term variance of the measured signal rate of change includes a plurality of filters performing averaging function.

12. (original) The system according to claim 11, wherein the filters selected from a group comprising analog filters, digital IIR filters, digital FIR filters, and rolling average filters.

13. (original) The system according to claim 8, wherein the system being implemented in a software program includes a set of computer-executable program instructions executed within the gas turbine engine control system.

14. (original) The system according to claim 8, wherein the system being implemented is in a hardware circuitry.

15-21. (canceled)

22. (currently amended) A method useable in electrical control sensors for shaft speed signal frequency change rate tests, detecting intermittent or "in-range" failures of the signal rate of change, comprising the following steps:

- (a) measuring frequency of a shaft speed signal;
- 5 (b) calculating a rate of change (time derivative) of the measured signal;
- (c) estimating a short-term variance (~~standard deviation~~) of the measured signal rate of change using the equation: $\text{Var}[x] = \text{E}[x - \text{E}(x)]^2 = \text{E}[x^2] - \text{E}^2[x]$, where x is the measured signal rate of change, $\text{E}(x)$ is the expected value of x , $\text{E}[x^2]$ is the expected value of x^2 , calculated by estimating the average of x^2 an estimated average of the measured signal squared rate of change over a predefined short term, and $\text{E}^2[x]$ is the squared value of $\text{E}[x]$, where $\text{E}[x]$ is calculated by estimating the a squared estimated average of the measured signal rate of change over the predefined short term;
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- 15 (d) estimating the short-term variance $\text{Var}[x] = \text{E}[x^2] - \text{E}^2[x]$ by employing the following algorithm: $\text{Var}[x] = \text{Filtered} [(x)^2] - (\text{Filtered} [x])^2$;
- (~~e~~) (e) comparing the estimated variance with a predefined variance limit for a predefined amount of time; and
- (~~e~~) (f) if the estimated variance exceeds the predefined variance
- 20 limit for the predetermined amount of time, deeming the measured signal invalid.

23. (original) The method according to claim 22, wherein the step for comparing the estimated variance with a predefined variance limit for a predefined amount of time uses a latching counter.

24. (currently amended) The method according to claim 23, wherein the latching counter time out rate being proportional to a time period the measured input is ~~true~~ one.

25. (original) The method according to claim 22, wherein the step for estimating a short-term variance of the measured signal rate of change using a plurality of filters perform averaging function.

26. (original) The method according to claim 25, wherein the filters selected from a group comprising analog filters, digital IIR filters, digital FIR filters, and rolling average filters.

27. (original) The method according to claim 22, wherein the method being implemented in a software program includes a set of computer-executable program instructions executed within the gas turbine engine control system.

28. (original) The method according to claim 22, wherein the method being implemented is in a hardware circuitry.

Please add the following new claims:

29. (New) A signal fault detection system for an engine compressor fan having a shaft speed signal Nfan, comprising:
- means for measuring frequency of the shaft speed signal Nfan;
 - means for calculating a rate of change (time derivative) of the
- 5 measured signal;
- means for estimating a short-term variance of the measured signal rate of change using the equation: $\text{Var}[d(N_{\text{fan}})/dt] = E[d(N_{\text{fan}})/dt]^2 - E[(d(N_{\text{fan}})/dt)^2]$, where $d(N_{\text{fan}})/dt$ is the measured signal rate of change, $E[d(N_{\text{fan}})/dt]$ is the expected value of
- 10 $d(N_{\text{fan}})/dt$, $E[(d(N_{\text{fan}})/dt)^2]$ is the expected value of $(d(N_{\text{fan}})/dt)^2$, calculated by estimating the average of $(d(N_{\text{fan}})/dt)^2$ over a predefined short term, and $E^2[d(N_{\text{fan}})/dt]$ is the squared value of $E[d(N_{\text{fan}})/dt]$, where $E[d(N_{\text{fan}})/dt]$ is calculated by estimating the average of the measured signal rate of change over the predefined short term;

15 means for comparing the estimated variance with a predefined variance limit for a predefined amount of time; and

means for deeming the measured signal invalid, if the estimated variance exceeds the predefined variance limit for the predefined amount of time.

30. (New) A method for signal fault detection for an engine compressor fan having a shaft speed signal Nfan, comprising:

measuring frequency of the shaft speed signal Nfan;

5 calculating a rate of change (time derivative) of the measured signal;

estimating a short-term variance of the measured signal rate of change using the equation: $\text{Var}[d(Nfan)/dt] = E[d(Nfan)/dt - E(d(Nfan)/dt)]^2 = E[(d(Nfan)/dt)^2] - E^2[d(Nfan)/dt]$, where $d(Nfan)/dt$ is the measured signal rate of change, $E(d(Nfan)/dt)$ is the expected value of $d(Nfan)/dt$, $E[(d(Nfan)/dt)^2]$ is the
10 expected value of $(d(Nfan)/dt)^2$, calculated by estimating the average of $(d(Nfan)/dt)^2$ over a predefined short term, and $E^2[d(Nfan)/dt]$ is the squared value of $E[d(Nfan)/dt]$, where $E[d(Nfan)/dt]$ is calculated by estimating the average of the measured signal rate of change over the predefined short term;

15 comparing the estimated variance with a predefined variance limit for a predefined amount of time; and

deeming the measured signal invalid, if the estimated variance exceeds the predefined variance limit for the predefined amount of time.

31. (New) A signal fault detection method useable in electrical control sensors for temperature signal change rate tests, detecting intermittent or "in-range" failures of the signal, comprising:

means for measuring a temperature signal;

5 means for estimating a short-term variance of the measured signal using the equation: $\text{Var}[x] = E[x - E(x)]^2 = E[x^2] - E^2[x]$, where x is the measured

signal, $E(x)$ is the expected value of x , $E[x^2]$ is the expected value of x^2 , calculated by estimating the average of x^2 over a predefined short term, and $E^2[x]$ is the squared value of $E[x]$, where $E[x]$ is calculated by estimating the average of the measured signal x over a predefined short term;

10 means for estimating the short-term variance $\text{Var}[x] = E[x^2] - E^2[x]$ by employing the following algorithm: $\text{Var}[x] = \text{Filtered}[(x)^2] - (\text{Filtered}[x])^2$. In this algorithm the approximate value of the expectation operation (E), which is the estimated short term average signal x , is obtained by an averaging filter.

15 means for comparing the estimated variance with a predefined variance limit for a predefined amount of time; and

means for deeming the measured signal faulted or invalid, if the estimated variance exceeds the predefined variance limit for the predefined amount of time.

32. (New) The system according to claim 31, wherein the means for comparing the estimated variance with a predefined variance limit for a predefined amount of time includes a latching counter.

33. (New) The system according to claim 31, wherein the means for estimating a short-term variance of the measured signal by employing an averaging filter to perform the expectation operation, where the averaging filter includes a plurality of filters performing averaging function in the calculation of $E[x^2]$ and $E^2[x]$.

34. (New) The system according to claim 33, wherein the filters selected from a group comprising analog filters, digital IIR filters, digital FIR filters, and rolling average filters.

35. (New) The system according to claim 31, wherein the system being implemented in a software program includes a set of computer-executable program instructions.

36. (New) The system according to claim 31, wherein the system being implemented is in a hardware circuitry.